

( A New Proposal to Jefferson Lab PAC-18)

**Measurements of the Light Quark and Antiquark Distribution Ratios in  
the Nucleon Through Semi-Inclusive Reactions**

X. Jiang (Co-Spokesperson)<sup>a</sup>, R. Ransome (Co-Spokesperson), S. Dieterich,  
G. Kumbartzki, R. Gilman, C. Glashausser, S. Strauch  
*Rutgers University, Piscataway, New Jersey, USA*

J.-P. Chen, E. Chudakov, B. Wojtsekhowski, P. Degtiarenko, O. Hansen, K. de Jager,  
J. LeRose, R. Michaels, A. Saha  
*Jefferson Lab, Newport News, Virginia, USA*

I. Danchev, R. Grima, R. Lindgren, V. Nelyubin, B. Norum, B. Sawatzky, A. Stolin,  
K. Wang  
*University of Virginia, Charlottesville, Virginia, USA*

W. Bertozzi, S. Gilad, D.W. Higinbotham, R. Suleiman, Z. Zhou  
*Massachusetts Institute of Technology, Cambridge, Massachusetts, USA*

J. Calarco and W. Hersman  
*University of New Hampshire, Durham, New Hampshire, USA*

R. Hicks, A. Hotta, R. Miskimen, G. Peterson, J. Shaw  
*University of Massachusetts, Amherst, Massachusetts, USA*

S. Churchwell  
*Duke University, Durham, North Carolina, USA*

M. Jones  
*University of Maryland, College Park, Maryland, USA*

T.-H. Chang, A. Nathan  
*University of Illinois, Urbana-Champaign, Illinois, USA*

We propose to measure the semi-inclusive ( $e, e'\pi^+$ ) and ( $e, e'\pi^-$ ) yield ratios on hydrogen and deuterium in the kinematic range of  $0.1 < x < 0.4$ ,  $1.0 < Q^2 < 4.0 \text{ GeV}^2$ , and  $7.0 < W^2 < 9.5 \text{ GeV}^2$  in JLab Hall-A with a 6 GeV electron beam. In the case that a generalized form of factorization between the virtual photon-quark hard scattering process and quark hadronization applies, the charge pion yield ratio can be easily related to  $(d+\bar{d})/(u+\bar{u})$  and  $(d-\bar{d})/(u-\bar{u})$ . We propose to determine the above ratios to 1.25% and 0.5% statistical accuracy, respectively, to provide strong constraints on the quark distribution functions. This experiment will also allow us to determine if a significant asymmetry exists between the  $\bar{d}$  and  $\bar{u}$  distributions.

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<sup>a</sup>Contact person. Email: jiang@jlab.org